A HIGH PRESSURE, SHOCK RESISTANT SEAL FOR COAXIAL CABLE

R.C. DeHart
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TECHNICAL REPORT
PROJECT 03-1284

Contract No. Nonr 3940(00)

for

Department of the Navy
Office of Naval Research
Washington 25, D.C.

July 1964

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APPROVED:

Robert C. DeHart

Robert C. DeHart, Director
Department of Structural Research

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I. ABSTRACT

An inexpensive device for sealing one-half-inch diameter coaxial cable against 4500 psi gas pressure on which explosively generated shock pressure is superposed has operated successfully for repeated shots. No distortion of transducer signal due to the seal has been noted.

II. DESCRIPTION

Detonations within pressure vessels to study the effects of deep sea explosions offer both economic and technical advantages. Shock pressures superposed on static pressures up to 5000 psi allow for simulation of explosions at depths to over 10,000 feet. A gas blanket is usually maintained over the water in the vessel. Tourmaline piezoelectric crystals are used to detect the transient pressures, which have risetimes of a few microseconds. To obtain minimum distortion in the pressure decay record, it is necessary to use low noise coaxial cable to transmit the signal from the transducers to the oscilloscopes.

The acceptable cable is neoprene jacketed and has an outside diameter of one-half inch. Due to the nature of the pulse, the associated shielding problems and the necessity for sealing against moisture, it is desirable to have an unbroken cable from the transducer to a point external to the vessel.

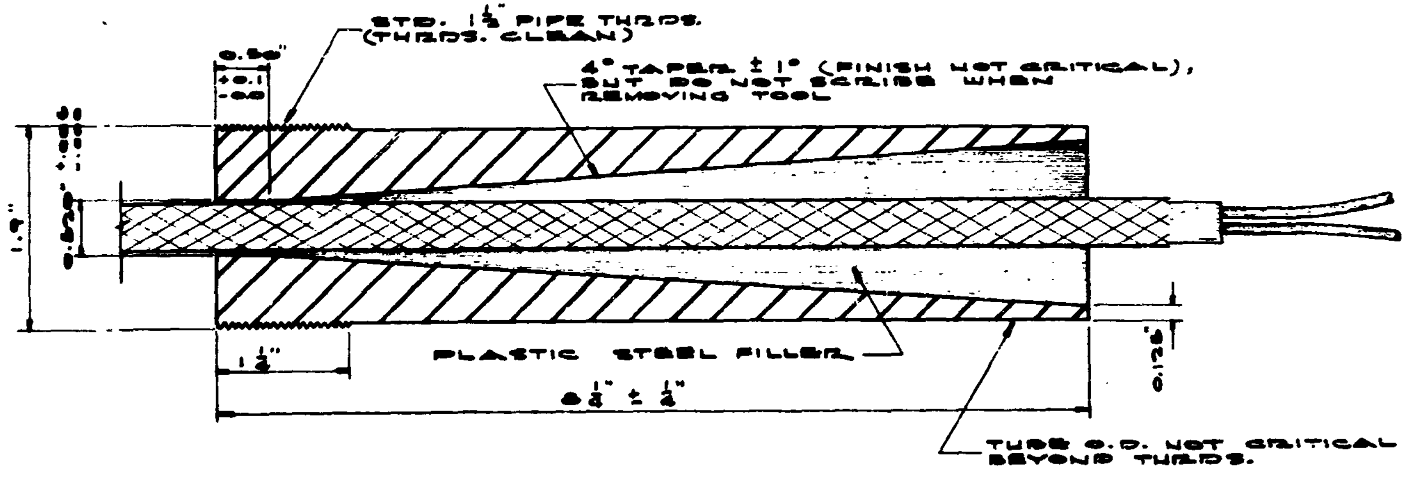
Two initial efforts to seal the cable with wedge-shaped conical inserts of teflon and nylon were unsuccessful--the nylon would not deform adequately, and the initial clamping force required with the teflon was sufficient to ruin the electrical properties of the cable. It was also determined that an appropriate wedge could not be vulcanized as an integral part of the cable without extreme difficulty.

A suitable seal as shown in Figure 1 was obtained by using a plastic steel diluted with a softening agent. When a thinner was used to insure

complete penetration to thin parts of the wedge, adequate stiffness and strength were not achieved. The desired flexibility of the filler approximated that of a rubber tire.

To achieve proper bonding between the neoprene surface of the cable and the plastic filler, it was necessary to roughen the neoprene with sandpaper and clean it with toluene. It was not necessary, however, to cure the assembly in a vacuum, but this would undoubtedly improve the resistance of the seal as would partial notching into the neoprene.

The seal assembly operates on the principal of pressure induced friction, and it is important to insure slight flexibility of the plastic filler to prevent relative motion between various layers of the cable. Successful resistance against air has been obtained to 5500 psi. Several assemblies have served multiple tests during which shock pressures have been superposed on air blankets of up to 4500 psi.



NOTES:

MATERIAL: MILD STEEL

TOLERENCES: ± 1/32 UNLESS NOTED

DATE 5-28-64 SCALE FULL	HIGH PRESSURE COAXIAL CABLE SEAL
DRAWN BY L. T. GUILLOT	
DESIGNED BY B. W. VANZANT	DEPARTMENT OF STRUCTURAL RESEARCH
CHECKED BY	SOUTHWEST RESEARCH INSTITUTE
APPROVED BY	SAN ANTONIO, TEXAS
	DRAWING NUMBER 03-1284-1